KAYMOOR COAL MINE
New River Gorge National River
Fayetteville vicinity
Fayette County
West Virginia

HAER NO. WV-38

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Historic American Engineering Record
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

KAY MOOR COAL MINE

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Location:	Approximately two miles upstream from the U.S. Highway 19 bridge spanning the New River Gorge National River, on the west side, in Fayette County, West Virginia. UTMs Headhouse, 17.494190.4210890 Processing Plant, 17.494460.4211020 Quad: Fayetteville, West Virginia
Date of Construction:	1899 - 1900; altered ca. 1925 - 1928
Present Owner:	New River Gorge National River, National Park Service, Department of the Interior.
Present Use:	None.
Significance:	Kay Moor coal mine exhibits important examples of early 20th century mining technology. Its two extant inclines and headhouse are examples of specialized adaptations to mining coal from outcrops located on steep slopes. The processing plant contains a Simon-Carves Baum Jig coal washer, shaker screens and other equipment introduced during the 1920's, an important era in the transition to mechanically cleaned coal. Over the years the original two-word spelling of Kay Moor has been modified to one word so that most current maps and literature spell the mine's name as Kaymoor.
Historian:	Jack Bergstresser
Project Information:	This documentation was undertaken by the Historic American Engineering Record during the summer of 1986. It was cosponsored by the New River Gorge National River and the Historic American Buildings Survey / Historic American Engineering Record (HABS/HAER).

INTRODUCTION

Now that the world's largest single arch bridge makes it possible to cross the 900 foot deep gorge of West Virginia's New River in less than a minute it is difficult to imagine the challenges those steep slopes posed to mining engineers at the turn of the twentieth century. But the remains of Kay Moor coal mine, two miles up river, reveal many clues to the problems they encountered and the solutions they found. Their greatest obstacle was the elevation of the Sewell seam, one of the major seams in southern West Virginia's famous low volatile, "smokeless" coal field. It out cropped several hundred feet up the precipitous walls of the gorge, a long and treacherous distance above the tracks of the Chesapeake and Ohio Railroad that snaked along the banks of the New River.

The routine problems of opening and operating a coal mine became secondary to three unique problems posed by such difficult terrain. The first was to get miners and supplies to the drift opening each day. Kay Moor's solution was a "mountain haulage", a single track incline with cable hoisting drum.[1] Safely and quickly lowering the hard won coal to the processing plant and bee hive coke ovens below was the second unique problem. It was solved by the installation of a two track gravity incline, equipped with monitor cars, that traversed 1000 feet of 30 degree slope to deliver coal to processing facilities alongside the C&O railroad.[2] The third problem was slate disposal. If merely dumped in front of the drift opening in the traditional manner slate would eventually, as Kay Moor's first owners discovered, begin to slide onto the tracks of the C&O railroad. The solution was yet another incline which pulled slate cars to the top of the gorge where they were dumped well away from the edge.[3]

The remains of these three incline systems are in varying states of preservation. All that exists of the last hoisting room of the "mountain haulage" is a concrete foundation and partial walls. The tracks of the "mountain haulage" and the monitor incline remain, but the only evidence of the slate disposal incline are two tunnels, cut through the cap rock at the top of the gorge, through which the slate car tracks passed. The headhouse, at the main drift opening, which served the dual purpose as tipple and cable drum room for the monitor incline is still standing.

The innovative use of the ancient principle of the inclined plane was a significant feature of American mining technology at the turn of the 20th century. Steadily increasing demand for coal, particularly for good coking coal, had led to the opening of many coal fields in regions previously considered inaccessible. Because the coal in these isolated regions was often located in steep slopes, coal miners adopted a multitude of special techniques for moving men and materials. Kay Moor's three inclines are excellent examples of those techniques which became more widely used.

But Kay Moor has historical value for other reasons. After the challenges of New River's steep slope were mastered, coal mining became a routine operation, much like coal mining any where else in the United States. Bee hive coke ovens, a power house, a processing plant and many other typical features of coal mining in the era remain. And, as the coal industry changed, Kay Moor changed. It therefore contains many examples of evolving American coal mining technology between 1900 and 1962. At times, as around 1928, when a Simon-Carves Baum Jig washer was installed[4] it was on the cutting edge of new mining technology. At other times it lagged behind new trends.

BACKGROUND:

Two converging series of events led to the opening of Kay Moor Mine. The first was the completion of the Chesapeake and Ohio Railroad through the New River Gorge. The second was the modernization movement taking place 125 miles east, in the iron ore region around Allegheny County, Virginia. Following a national trend, blast furnace operators there began replacing their old charcoal furnaces with modern, coke fired, furnaces at about the same time that the C&O railroad opened the New River coal field.[5] The furnace operators needed coke and the C&O, which ran right through the middle of Allegheny County, could now deliver some of the best coking coal in the United States, from New River's Sewell seam, quickly and cheaply.[6]

One of the first iron companies to exploit this profitable situation was the Longdale Iron Company of Virginia which opened mining operations in the gorge near Sewell Station, around 1880, to supply their Lucy Selina furnace at Longdale. The Longdale operation was a classic example of a captive mine. Its principle reason for existence was to supply fuel to the furnaces of its parent company. Freshly mined coal was coked at the mine and shipped directly to the furnace.[7] The need to buy coal from outside sources was eliminated and the coke, much lighter than coal, could be transported more cheaply.

Success invites emulation. The Low Moor Iron Company, another Allegheny County pig iron producer followed suit. In 1899, they began opening their own coal mine on the opposite side of the New River, 560 vertical feet or 1000 feet up a 30 degree slope, above the southern branch of the C&O.[9]

Named Kay Moor, in honor of its builder, James Kay it was to be a model captive mining operation. Patterned after the model blast furnace community at Low Moor, Virginia, built by Low Moor Iron Company's founder A. A. Low, it would be entirely self sufficient. Two company towns, one at the top of the gorge and one at the bottom would insure a stable, dependent work force.

It would produce its own power in a stream powered generating plant to be built adjacent to the processing plant.[10] Coal would be coked at the mine before shipment to Low Moor's Covington Furnace. Since the mine would be capable of producing more coal than could be coked the mine, part of the surplus would be shipped to the company's coke ovens at Low Moor. Additional surplus would be sold on the open market defraying the cost of operating Kay Moor while producing extra profit.[11]

Kay Moor served Low Moor as a captive mine until 1924. By that time the fortunes of merchant pig iron producers (companies who sold raw pig iron to customers who manufactured cast iron products) were beginning to wane. Freight rates on Allegheny County pig iron were becoming prohibitive. Bee hive coke ovens were becoming obsolete. Low Moor faced profound challenges. When Kay Moor's processing plant burned in 1924, the company chose to sell the mine rather than build a costly new facility.[12]

The New River and Pocahontas Consolidated Coal Company, a subsidiary of Berwind-White Corporation (Philadelphia, PA.) bought Kay Moor in 1925. Shortly thereafter, they built a modern corrugated metal (fireproof) processing plant, designed by Link Belt Company. (Chicago, Illinois) A few years later, possibly in late 1928, Link Belt added a coal washing facility which featured a Simon-Carves Baum Jig Washer. Kay Moor would no longer serve as a captive mine. Its entire output, except for the small amount distributed to the company towns, would be placed on the open market, to be sold through the Berwind Corporation's vast distribution network.[13]

HISTORY OF KAY MOOR MINING PLANT:

As with most mines that operate for over half a century, Kay Moor's physical plant changed considerably over the years. In some cases, such as the processing plant, the transformation was total. An entirely new structure now stands on the site where Kay Moor's first processing plant once stood. In other cases change has been less extreme. The headhouse at the front of the main drift opening has undergone some modification, including the replacement of coal car dumping equipment, but is probably the original structure built in 1899 - 1900. In other cases, facilities, such as the power house, the bee hive coke ovens and the brick and concrete fan house, were simply abandoned when they became obsolete. Their major equipment was removed and they were allowed to deteriorate. Additional deterioration has taken place since the mine was closed in the early 1960s.

In order to describe this change, as far as currently available documentation and the scope of the present research project will allow, each major facility will be discussed individually. Since the Low Moor Iron Company's considerable collection of papers are preserved in the Alderman Manuscript Collection, at the University of Virginia at Charlottesville, much can be determined about Kay Moor's operation between 1899 and 1924. The papers of The New River and Pocahontas Consolidated Coal Company, however, are not currently available and may have been destroyed. Information regarding Kay Moor's operation between 1925 and 1962 therefore, is based upon on site inspection and the memories of former employees, and unfortunately, subject to the errors that such sources entail.

The Power House:

When the power house was completed in 1900 it was designed to produce the compressed air needed to power Kay Moor's 15 Harrison coal cutters, or punchers, and the mine's ventilation fan. Steam from three 72" diameter 18 foot Erie City Boilers, with a capacity of 150 horsepower each were to power the compressor. Since the compressor, with a 32" air intake cylinder and a 36" stroke, required a maximum of 425 horsepower, the boilers would have to be maintained in excellent condition to match its power needs.[14]

Between 1902 and 1903 the power house was enlarged to include a new steam engine and dynamo. An additional Erie City Boiler, capable of producing 125 horsepower of steam was also installed. The mine could now produce electricity for its new haulage locomotive, its mountain haulage motor, electric lights and other needs.[15]

The power house was modified several times to increase its capacity and reliability. By 1916 an Atlas Water Tube Boiler had been installed and two generators were operating. In 1916 a rotary converter for transforming AC power to DC was in place. In 1919 a new turbine and Sterling Boiler were installed. At that time the plant featured a Ballwood steam engine, ca. 1909 and Buckeye and Exciter engines of uncertain date.[16]

Despite regular improvements the plant apparently never was able to provide adequate power. As early as 1905 Kay Moor's mine superintendent complained that more boiler capacity was needed. He cited a total requirement of 733 horse power --425 by the air compressor, 238 by the electric generator, 50 by the mountain haulage and 10 horsepower each for the shaker screen and picking table motors in the processing plant-- from boilers capable of producing only 575 horsepower. The complaint was repeated in 1917 when F. V. Humbert, Low Moor's manager of mines, pointed out to Kay Moor superintendent C. C. Cooke, that a recent interruption of Kay Moor coke, due to breakdown of the power plant, had cost $10,000 worth lost production at the company's Covington Furnace. The loss came as no surprise to Cooke who had earlier recommended that Kay Moor purchase electrical power from Virginia Power Company. The recommendation was finally heeded around 1927 when Berwind switched Kay Moor to purchased power.[17]

Inside Mine Workings:

Kay Moor was a 10-foot wide double-entry drift mine. Drift mines were so named because they were driven into a coal seam that outcropped on the surface. They were different from slope and shaft mines whose coal seams never outcrop on the surface. A drift mine is less expensive to open because, from the first day, coal is being retrieved as the opening is advanced. In slope mines, whose opening proceeds downward on an angle less than 90 degrees, and shaft mines, whose opening is vertical, initial cost are higher because much preliminary digging, through rock and shale, is required before the buried coal seam is reached.[18]

Throughout its sixty-two years of operation, Kay Moor was mined by the room and pillar system. This was a common system in American coal mines. The main opening--in this instance, a double-entry drift with two parallel openings--is driven many hundred feet into the coal seam. Side openings are then driven off at a 90 degree angle from the main opening. In 1902 Kay Moor's side entries were spaced at about 450 foot intervals. These side entries were then driven a thousand feet or so. Once again at 90 degree angles, so that they were actually running parallel to the main entry, entries called rooms were driven. Moving backward toward the main entry, room after room would be opened, forming a long series of parallel openings. Since these rooms were not spaced far apart it was a simple matter to cut an opening from one room to the next. These openings facilitated the flow of air through the mine and provided a place for miners to hide while they detonated charges in the coal at the front of the room, called the face. In 1902 these openings, called break-throughs, were spaced 45 to 50 feet apart. The massive rectangular block of coal left between two rooms and two break-throughs was called a pillar, hence the term room and pillar mining. Since the pillars provided roof support they were left in place until a series of rooms were mined out. Then, in the most dangerous phase of the mining operation, they were removed as that area of the mine was abandoned.[19]

At the time that Kay Moor was opened, a major transition was taking place in the method of cutting a block of coal to prepare it to be blasted from the seam. Keith Dix has written an excellent account of this transition. By the old method picks were used. A skilled miner would, very laboriously, pick a narrow wedge several feet long and as deep as possible at the bottom of the coal seam. He would then drill holes into the coal at strategic locations, fill them with small explosive charges, and blast the coal down. Machines that could eliminate the time consuming pick undercutting process began to appear in the 1870's. One of the more successful of these was patented by J. W. Harrison and manufactured by the Whitcomb Company. (Chicago) The Harrison, "punch" or "pick" machine worked much like a jack-hammer. Driven by a compressed air cylinder, it was equipped with a large drill-like bit on the front of the machine which punched back and forth into the coal seam with much the same effect as a miner's pick.[20]

While the Harrison machine was popular throughout the 1880's and 1890's, by 1900 it was rapidly being replaced by more modern electrical under cutting machines. Curiously however, Kay Moor's owners chose to install an air compressor in the power house and place 18 Harrison machines in their mine. Other mines in the area, that were converting to machine undercutting, were adopting the newer electric machines. Since, as one of the Low Moor's own engineers was to point out a few years later, one electrical undercutting machine could do the work of five "punchers" an odd statistic began to appear in the West Virginia State Mine Inspector's Annual Report. Each year, for five years or so, Kay Moor would consistently appear as a leader in the number of mining machines employed. At the same time it would rank relatively low in the amount of machine mined coal. The disparity was due to Kay Moor's less productive Harrison punchers.[21]

After the electric generating plant was installed, between 1902 and 1903, Low Moor's engineers began discussing the need for electrical undercutting machines. While it would be several decades before machine mining would completely replace pick mining at Kay Moor, management tacitly accepted the fact that the Harrison "punchers" were obsolete. In 1905 two Low Vein Short Wall chain breast cutting machines were purchased. Manufactured by the Sullivan Machinery Company (Chicago), one of three leading manufactures, chain breast cutting machines under cut coal with an endless chain fitted with sharp bits. The chain rotated around a flat tongue-like guide that could slice ten feet into the bottom of a coal seam and then cut laterally as far as desired. By 1911 an additional Sullivan and two Morgan Gardner (Chicago) chain breast cutting machines had been added.[22]

By 1916 Kay Moor's management was committed to the strategy of becoming a "machine mine", or a mine that relied entirely on machine rather than pick mining techniques. The decision was based more on the hardness of Kay Moor coal, which made pick mining difficult, than a commitment to innovation. It never fully materialized. Kay Moor continued to add new undercutting machines to its inventory, including, by this time, Goodman machines (Charleston, West Virginia) but pick mining continued, particularly for pillar removal.[23]

Another area in which Kay Moor management moved sporadically toward mechanization was in its underground haulage system. Before the mine's generator was installed haulage was accomplished entirely by mule power. Mules would pick up cars loaded with coal and slate from the mine rooms and haul them all the way out of the mine. After electricity became available, two trolley locomotives were added. Manufactured by the Jeffrey Manufacturing Company (Columbus, Ohio), they derived their name from the fact that they received electrical current for their motors from a trolley arm connected to wire mounted to the roof of the mine. While the locomotives introduced a danger factor, because of their bare, exposed electrical wires, they were faster and capable of hauling greater loads then temperamental mules.[24]

Kay Moor's first two electric locomotives did not entirely displace mule power, however. They were main haulage locomotives, that were restricted to the track which ran along the main drift opening. Coal and slate cars that traveled from the rooms to the side entries and into the main drift opening were still hauled by mules.[25]

The number of locomotives gradually increased. By 1908 Kay Moor had 3 locomotives, by 1911 it had 4. In 1916 or 1917, following the decision to convert Kay Moor to a "machine mine", five additional locomotives were purchased. These were probably all gathering locomotives, whose purpose was to replace mule haulage, gathering slate and coal cars from the rooms and hauling them to the main entry for transfer to the main haulage locomotives.

A letter from superintendent E. M. Cabell, to Manager of Mines J. W. Monteith, written September 21, 1919 indicates not only the probable manner in which these and additional new locomotives were used, but, also the extent to which Kay Moor had been converted to a "machine mine". Cabell wrote that certain sections of Kay Moor were designated "motor and machine sections". In each of two sections four gathering locomotives were in service. Several mining machines were also in use, each serving 18 miners. By 1926, after ownership of Kay Moor had passed to Berwind-White, mule haulage had been eliminated completely but the State Mine Inspector's report listed 26 pick miners. It is not clear if these pick miners were still using the old manual methods of under cutting or serving in some other capacity.[26]

When and to what extent Kay Moor was transformed into a mechanically loaded mine is even less well documented. It appears that, some time in the 1930's, conveyers were brought in. At first miners hand loaded coal onto the conveyers to be carried from the working face to cars at the side entries. Later, in the 1940s, if not earlier, Goodman Duck Bill loaders were installed. These loaders had flexible arms, resembling duck bills, that mechanically scooped coal onto the conveyers.[27]

Ventilation:

As with all coal mines, Kay Moor faced a complex and constantly changing problem of providing adequate ventilation to its underground workings. The remains of two fan houses with their own drift openings, located several hundred yards apart, indicate at least one radical alteration of Kay Moor's ventilation system. Documentation from the Low Moor collection suggests, however, that alterations, on a smaller scale, occurred frequently.

The concrete and brick fan house adjacent to the main drift entry was built in 1919 after a fire, caused by oil soaked wiring, had done considerable damage to the wooden fan house. The belated decision to build the fireproof structure came after 18 years of ill-luck with wooden fan houses, during which time three fires occurred.[28]

The first fire came in 1902. (The date of the second fire has not, as yet, been documented.) It destroyed the structure on which a 20 foot Crawford and McCrimmon fan, (Brazil, Indiana) powered by compressed air, had been mounted. A temporary furnace ventilating system was installed until the 20 foot Crawford McCrimmon fan was replaced the following year. The replacement system was set up to force air into the mine, a change from the old exhaust system which had drawn air through the main drift entry to be exhausted through the fan opening.[29]

The question, of whether the fan system should force the air into the mine and out the drift entries or pull air through the drift entries to exhaust via the ventilation opening, was never fully resolved. Nor was the question of the correct fan diameter and rpms. A sixteen foot fan was employed briefly around 1906. It was soon replaced by an 8 foot 4 inch electrically powered, double inlet, Sirocco fan (American Blower Company, Detroit) in 1909.[30]

The Sirocco fan was considered one of the best available at the time. Developed during the last years of the 19th century, it was distinctive for its large number of blades and a large shallow intake orifice which enabled a relatively smaller diameter fan to produce a larger volume of air. Older centrifugal fans featured large blades that extended up to 1/3 the length from the periphery of their wheel. The large number of small blades on the Sirocco fan extended only 1/16 of the length.[31]

The new fan proved so satisfactory that Kay Moor's first owners were reluctant to abandon it. When the new concrete and brick fan house was built in 1919 the Sirocco fan was retained. At that time the state mine inspector recommended that the system be changed from force to exhaust but it is not certain if the suggestion was heeded. In 1922 the, by now, 13 year old Sirocco was replaced by a 10 fan which was in turn replaced in 1928 by an 8 foot fan. The manufacturer of these later fans has yet to be documented. Another point that cannot be documented, as yet, is the exact origins of two other ventilation openings next to the opening nearest to the concrete and brick fan house.[32]

The second fan house, built by Berwind-White, is located just south of Butcher branch, several hundred yards down river from its predecessor. Built in the early 1930s, it is less well preserved than the older Low Moor fan house. The type of fan that it housed has not been determined.[33]

The Bench Level:

Because Kay Moor was opened on a steep slope, 560 vertical feet above the floor of the New River Gorge, a narrow bench was constructed to facilitate the movement of men, coal cars, slate cars, locomotives and other traffic. Even then a maze of tracks and the constant movement of men and machines required an organized routine to avoid accidents or delays in the flow of coal.

In addition to the mine openings, several other facilities were located at the bench level. The most prominent of these was the headhouse, a dual purpose structure that served first as a tipple for transferring freshly mined coal from mine cars to the incline monitors. Secondly, it housed the control room and woodlapped cable drum that lowered monitor cars down slope to the processing plant. Adjacent to the headhouse stood a woodframe building. The bottom floor of this building served as a repair shop for coal cars. The top floors served as office and storage space. In later years a cinder block office and lamp house was built into the side of the gorge directly behind the larger building.

Further along the bench, up river from the head house and office building, was the drop off point for the mountain haulage. For years this drop off point was the only access to the bench level, other than the monitor incline, which was restricted to coal haulage, and a flight of concrete stairs to the top of the gorge.[34] Men, explosives, mine locomotives, everything required to operate the mine, reached the bench level via this one drop off point.

Up river from the mountain haulage drop off point was the powder house. Here, in earlier days, black powder and fuses were stored. Later after permissible explosives such as dynamite replaced black powder, a portion of the powder house was converted to a storage room for detonator caps. The main room became a storage area for the new, more powerful, explosives.

Beyond the powder house was the electrical shop. It was here that Kay Moor's electric mine locomotives were repaired. Nothing remains of the electrical shop except a concrete slab. A distinctive feature of this slab is a rectangular well, a recess a few feet wide and deep enough for an electrician to stand in as he worked on the bottom of a mine locomotive.[35]

A tram road once extended beyond the electrical shop for several hundred yards. It was used by independent miners who contracted with Low Moor to open their own small operations in the Sewell seam upstream from the Kay Moor workings. These miners transported their coal, via the tram road, to the head house where it was weighed and credited to their account.[36]

Down stream from the headhouse, a few yards beyond the Low Moor fan house was the incline for hauling slate to the top of the gorge. Built at least as early as this incline replaced the earlier disposal system whereby slate was hauled to a small tipple near the electrical shop and dumped down the slope. After a few years the accumulation of slate became so large that it began threatening to block the tracks of the C&O railroad in the floor of the gorge. The new incline, equipped with a cable drum powered by an electric motor, pulled mine cars filled with slate to the top of the gorge where it was dumped a safe distance from the edge.[37]

Movement of men, mine cars, locomotives:

Obviously, with so many buildings and so many functions being performed, the movement of men, mine cars and locomotives had to proceed by a tightly organized routine or chaos would ensue. While it was probably modified several times over the 62 years that Kay Moor operated, Clifford "Knott County" Davis, the mine's last superintendent provided the writer with the following description of routine traffic flow during his tenure.

Each morning, miners were shuttled to the bench from their respective mining camps at the top or the bottom of the gorge via the "mountain haulage". The miners moved from the haulage drop off point to the lamp house where they picked up their lamps and other equipment. They then entered a waiting room, just inside one of the mine's four drift openings, and awaited a mine locomotive, pulling empty cars, that would transport them to their work places deep within the mine. Once at work they began loading empty mine cars with either coal or shale.

When loaded, these cars were hauled to the main locomotive track. There the main haulage locomotive picked up strings of the loaded cars and proceeded to the surface. At the main drift opening, the locomotive, coal cars and slate cars diverged and followed one of three separate tracks. The locomotive stopped momentarily to allow a "scotch man" to disconnect the string of coal and slate cars, then switched off the main track, proceeded onto a siding in the headhouse (located directly in front of the main drift opening), reversed its motor and reentered the mine through a separate locomotive opening. If the locomotive needed repairs it could proceed a few hundred feet into the mine, switch over to another track, reverse its motor and exit through a third opening, the locomotive repair exit, to the electrical shop. Gathering locomotives needing repair used the same exit. If repairs were not necessary, the main haulage locomotive would pick up any empty "slate cars" that might be waiting on their separate track outside the mine near the locomotive reentry opening. Immediately inside the mine, the locomotive picked up any waiting empty coal cars that had been brought back into the mine through a fourth opening, the empty coal car entrance, by means of a mechanical car mover referred to by miners as a "creeper".

The coal and "slate cars" that had been detached at the main drift opening were released individually onto one of two tracks. "Slate cars" rolled, by gravity, around the north side of the bench where they were connected to the cable of the slate incline to be hoisted to the top of the gorge and dumped. Once dumped, the "slate cars" were returned to bench level where they passed under the scales in the headhouse and came to a stop, ready to be hauled back into the mine by the main haulage locomotive via the locomotive reentry opening. If repairs were necessary, they could be switched onto a track that led into the car repair shop.

Back at the main drift opening meanwhile, the scotchman released coal cars, to roll by gravity, into the headhouse where they were weighed, dumped, and returned, via the empty coal car entrance, to the mine.[38]

The Headhouse:

One of the more significant structures at Kay Moor, the headhouse is a specialized adaptation to the unique problems of mining coal from a drift opening on a steep slope. Traditional headhouses served a shaft or slope mine, performing two functions. First it housed the cable drum, and its power source, that was used to hoist coal from the mine workings to the surface. Secondly, it often served as a tipple, housing the devices which dumped coal cars into storage bins or secondary transport facilities. In the Kay Moor headhouse, the sequence of the two functions was reversed and modified. It served first as a tipple then secondly as housing for a cable drum.

The difference between a traditional head house cable drum and the cable drum used on Kay Moor's monitor incline was that Kay Moor's lowered rather than raised coal. Since a traditional cable drum was part of a hoisting, rather than a lowering, operation a hoisting engine or motor was also required. This meant that a traditional cable drum room, was a larger and more elaborate affair. At Kay Moor it could hardly be called a cable drum room at all, consisting of no more than the drum itself and its cement moorings.

The rising popularity of gravity monitor inclines, around 1900, extended the working career of the wood-lagged cable drum. Named for the seasoned wood lags that covered the outer circumference of the drum, they were becoming obsolete in modern hoisting plants of the era where smaller metal drums not only provided greater durability but also saved space. Since gravity inclines required no hoisting engine economy of space was less important. The larger circumference wood-lagged cable drum was pressed into service because of the long lengths of thick cable which did work as well on small metal drums.[39]

Since it was a drift mine on a relatively level seam of coal, electric haulage locomotives could perform the task of bringing Kay Moor's coal to the surface. The task was then to safely and rapidly lower the coal down hill so that interruptions in production did not occur. Some mines avoided the cost of installing a tipple at the drift opening by lowering coal cars directly down slope but this option was never shown to be effective on inclines with a grade of more than 20 degrees.[40] Instead most mines in the New River Gorge relied on retarding conveyors, such as the rope and button system at Nuttleburg, or monitor inclines like that at Kay Moor.

Before coal could be lowered by monitor cars, however, it had to be transferred from the coal cars in which it was brought to the surface. In addition, so that miners could be properly credited for the tonnage they mined, the coal had to be weighed as soon as it left the mine. The top section of Kay Moor's headhouse contained a elaborate set of tracks, scales, car dumps, switches and turnouts designed to handle, with out interruption, the full capacity of its under ground workings. A description of the movement coal in the headhouse illustrates the dual functions that it served.

Once the "scotch man", at the main drift entry, released a coal car it rolled to the car stop at the entrance of the headhouse where the Checkweighman, or his assistant, released each car, individually, onto the scales. Here the weight of the coal it contained was recorded. The scotching device, used to retard cars at the drift opening, has since been removed but parts of the car stop at the headhouse entrance remain.[41]

When Kay Moor was first opened, a number 2162 double beam, five ton scale (Standard Scale and Supply Company, Pittsburgh) was installed.[42] Its length of service is uncertain but an inscription; "rebuilt, Oct. 1945", on a beam in the scale platform, suggests that it was replaced at least once during the life time of the headhouse. After Kay Moor was closed, the scales were removed leaving only the platform they once supported.

Once weighed, the loaded coal car proceeded, again by gravity, to the car dumps. If, in exceptional cases, the car contained an unacceptable amount of shale and rock it was dumped at the first of two dumps, cradle or side dumper, manufactured by Car Dumper and Equipment Company. (Chicago) Treated as waste material, the dirty coal fell into the cradle dump hopper and passed into a chute under the headhouse where it awaited transport to the slag pile for disposal.[43] The cradle dump hopper was also capable of feeding onto an apron conveyor that discharged into the main storage bin of the headhouse, indicating that the cradle dump occasionally was used to dumped coal.

Under normal circumstances however, loaded coal cars proceeded over the cradle dump onto the Phillips Car Retarded and Cross Over Dump. (Phillips Mine and Mill Supply, Pittsburgh) The car retarded released cars individually onto the cross over dump where they were tipped forward and emptied into a hopper. At the bottom of the hopper a reciprocating feeder fed coal, via one of two routes, into the storage bin. If the bottom of the reciprocating feeder was open the coal passed straight down into the top of the main storage bin. If the bottom of the feeder was closed the coal passed onto a flight conveyor that lowered the coal more gently into the bottom of the main storage bin.[44]

It appears, from documentation in the Low Moor Collection, that the first car dumpers installed at the headhouse were cradle or side dumps that tipped coal cars sideways to discharge their loads. They were probably supplied by the Jeffrey Manufacturing Company. (Columbus, Ohio) In 1917 or 1918 a Phillips Crossover Dump was installed. It has not been possible to determine if the two dumps still in place in the head are the same as those referred to in Low Moor correspondences or if they were installed later.[45] A beam mounted to the cradle dump is dated 1926 but it could not be determined if the beam was added onto an older dump or was part of a new one.

Once emptied the coal cars moved forward, to the front of the headhouse and switched onto the "creeper track" where the creeper snagged the bottom of the car an carried it back into the mine. If a car was in need of repair it was switched onto a track which bypassed the creeper track and led into the repair shop.[46] When the headhouse was first built the empty cars were returned to the mine by means of a small engine. The date when it was replaced by the creeper is not known. In any regard, both systems of empty car haulage were crucial to the mine's operation. A 1903 correspondence from Kay Moor superintendent, H. L. Tansill to Low Moor indicates that the mine had to be closed while the small engine powering the empty car haulage was repaired.[47]

While all this movement was taking place on the top, coal from the main storage bin, which comprised a large section of the headhouse, was being fed, through chutes, into a monitor car for the trip down slope to track level.

The Motor Incline:

Coal leaving the head house sped 1000 feet, down the 30 degree slope of the monitor incline, to reach the processing plant at the railroad track level. The incline worked by gravity. It consisted of two sets of parallel tracks. One six ton monitor car (At other times 8 ton cars were used) rode on each track. the two monitors were attached to wire rope cables mounted to the cable drum in the head house. The cables were precisely wound on the drum so that one monitor was in exact position, under the loading chute at the head house, while the other was in exact position, at the discharge point at track level. This exact positioning allowed the monitor operator, the "drum runner", to take maximum advantage of the force of gravity. One of the most skilled workers in entire mining operation, the drum runner filled the top monitor with coal until it became heavy enough to pull the bottom monitor back up the incline.[48] He then eased off on the brakes on the cable drum. The monitor cars raced to change positions passing at the half way point of the incline. The drum runners job was to move coal down the incline as fast as possible while avoiding the damage that might occur if he lost control of a fully loaded monitor. A study conducted by one of Kay Moor's mining engineers, around 1910-1911, indicates that a monitor could travel from bottom to top, take on a load of coal and be ready drop down the incline in less than two minutes. Accounting for minor delays that might occur, the maximum capacity of the incline was 25 monitor loads per hour.[49]

While it was one of the most important links in the flow of coal at Kay Moor, the monitor incline could also be one of the most troublesome. Given the level of mining technology at the turn of the twentieth century, it was one of the more acceptable, but by no means ideal, solutions for lowering coal down long steep slopes. Since coal handled by an incline system was transferred so many times, first from the coal cars to the head house storage bin, then from the storage bin to the monitor car, then from the monitor car to the processing plant delivery system, a great deal of breakage occurred. But, coal breakage was less of a problem than wrecks and derailments. Monitors had to be repaired or replaced frequently as a result of the such accidents. In addition, the monitor track was prone to slippage caused sometimes by erosion and sometimes by the simple action of gravity.[50] Letters from Kay Moor's mine superintendents to the main office at Low Moor contain occasional references to the great effort required to keep the incline track in serviceable condition.[51]

Track Level:

At the time Kay Moor was closed in 1962, freshly mined coal was lowered down the gravity incline and arrived at the railroad track level where it was dumped into a 100-ton hopper and fed, by a reciprocating feeder, onto a horizontal belt conveyor (manufactured by the Link Belt Company, Chicago).[52] From there coal was carried into the processing plant where it was sorted, washed, if necessary, and loaded into railroad cars for shipment.

The Original Processing Plant:

The current layout of facilities at track level is quite different from the original system installed by Low Moor at the turn of the century. The original feed system from monitors to processing plant is difficult to document but several elements of Kay Moor's original processing can at least be sketchily described. The most important thing to remember about the original plant is that it was devoted to supplying two large banks of bee hive coke ovens. They were fueled with slack coal, the very small sizes of coal coming from the mine. A significant portion of the earlier plant therefore, consisted of facilities and equipment for recovering, storing and transferring slack to the coke ovens. A crusher was installed to crush the larger sizes of coal on those occasions when the percentage of slack coming from the mine was too small to feed the coke ovens' enormous appetite. After the coke ovens were abandoned, around 1934, these facilities were dismantled. In fact, in later years, the coke ovens themselves were partially buried when Berwind began dumping refuge from its washing plant on top of them.[53]

Since a large percentage of Kay Moor's remaining output was shipped to Low Moor to be coked, no elaborate preparation was required. Run of mine coal (coal just as it came from the mine, with out screening or cleaning of any kind) was often sufficient, although screened coal was frequently requested.[54]

This left a relatively small percentage of Kay Moor coal to be sold on the open market. It was first sold, almost exclusively, in two sizes; lump or nut. Later, after two 1 1/4" shaker screens were installed around 1911-1912 Kay Moor began producing egg coal. Since the dimensions of coal sold as lump, egg and nut varied widely, it is difficult to determine the exact sizes that Kay Moor produced. It is probably safe to assume that any thing over 5 1/2" was sold as lump while any thing from 2" to 3" by 5 1/2 was sold as egg and the remainder, except slack, was sold as nut coal.[55]

This limited number of sizes required fewer loading tracks than Kay Moor's later processing plant. Three tracks, rather than five were sufficient. The first track, nearest the slope, loaded slack. The second track loaded nut and egg while the third loaded lump.[56]

Between 1900, when Kay Moor was opened, and the late 1920s, gradual changes were transforming the industry. Frequent improvements were necessary if a mining operation was to stay competitive but Kay Moor's owners appear to have become more and more unwilling to modernize their processing plant. Finally, by the time that the tipple burned, in 1924, the pressure to modernize must have been quite strong. Consumers had become much more demanding in the sizes and cleanliness of the coal they bought, the era of the bee hive coke was giving way to by-product coking and the era of washed coal was on the horizon.

Kay Moors' owners were willing to make improvements when absolutely necessary. By the early 1910s, most coal operators were abandoning the old straight chutes that discharged lump coal into railroad cars so roughly that much breakage occurred. Breakage was a particular problem with the very friable coals of the New River field. When Kay Moor's owners installed a spiral chute and loading conveyor in late 1911 or early 1912 they were right in line with trends in the industry. The two 1 1/4 shaking screens installed at the same time, which made it possible to produce both egg and nut, were also a timely response to changing consumer demand.[57]

But by 1916 Low Moor correspondences reveal that the company was becoming reluctant to address the problem of wholesale plant modernization. A new loading boom for loading lump coal into railroad cars was dearly needed. A letter from Low Moor's manager of mines to a potential supplier of the new equipment, however, reveals that the company was attempting to modernize in a piece meal fashion. Admitting that a new tipple was needed, the manager of mines stated that "we are not prepared as yet to go that additional expense."[58] When Low Moor did make a series of repairs and improvements in 1919 major changes were limited to new gravity screens, a 30" belt conveyor to replace the old chain conveyor that had formerly fed slack coal to a large storage bin and a new turbine generator in the power house. A new, fire proof tipple, of the corrugated metal style toward which the industry was moving, was not built.[59]

The Berwind Processing Plant:

Low Moor's continued reluctance to build a modern fire proof processing plant was to prove costly in 1924 when a fire in the aging plant caused its total destruction. Faced with the prospect of rebuilding, Low Moor sold Kay Moor the following year to the New River and Pocahontas Consolidated Coal Company, a subsidiary of Berwind-White Corporation of Philadelphia. Soon thereafter the new owners built the corrugated metal five track processing plant that is still standing. The new plant was designed by Link Belt company who supplied its major equipment including the belt conveyor from the monitor track, the main shaker screens and two loading booms. A large flight conveyor and slack storage tank were included in the new facility. The exact date that the new processing plant was built is not known so it is not possible to determine if the coal washing plant was a later addition or a part of the original plant. The washing plant itself could not have been installed until 1928 because that was the first year that Link Belt was authorized to sell the English Simon-Carves' Baum Jig Washer in the United States.[60]

The Simon-Carves Baum Jig Washer is probably the most significant piece of equipment at Kay Moor. It was one of the most popular types of coal washer introduced during the late 1920's, the era when mechanical coal cleaning became a standard feature of American coal mining. While mechanical coal washing had long been practiced in states like Alabama, where coal deposits contained large amounts of debris, other regions had avoided the costly installations until mechanized underground mining displaced pick mining. The transition to mechanized underground mining techniques made pick mining virtually obsolete and significantly increased productivity, but produced dirtier coal. Mechanical washing became a necessity. Machine loading, and mechanical coal cleaning became two the few significant industrial technologies that continued to develop in America during the depression.[61]

Jig coal washing is a technology that dates to the early 1830's. First employed in Freiburg, Germany, the essential element of a jig washer is a rod and plunger that is jigged, jerked in short sharp strokes, to agitate a tank of water and coal. Since coal has a lower specific gravity than most of the debris it contains, it will rise to the top of the tank while the heavier debris sinks to the bottom. All jig washers since the early Freiburg models, have employed this principle.[62]

A major improvement was made in 1892 by Fritz Baum of Hern, Germany, who replaced the plunger with a compressed air piston. The piston created a blast of air that was forced down on the water surface to create pulsations, in much the same way that a plunger did but without the suction created by the plunger's return stroke. This improvement made it possible to maintain better separation between coal and debris in the water tank. Baum further modified the coal washing process by screening and sorting coal after it had been washed rather than before as in the traditional method.[63]

The right to build Baum Jig washers in the British Empire was acquired by the English firm of Simon-Carves in 1902. The English company began improving the Baum Jig, which became the most popular type of coal washer in England. The Link Belt Simon-Carves washer installed at Kay Moor was the latest model available at the time and soon became a popular model in the United States.[64]

The processing plant at Kay Moor is actually three major systems contained in one plant. The first is the main screening system that separated coal to be sent either into the slack storage tank, into the coal washing room or onto loading booms to be dumped into railroad cars. The second system is the slack recovery and storage system. The third system is the coal washing and sorting system. Over the years as consumer demand led to more and more variety, not only in size but also in elaborate blends of sizes, coal operators built ever greater flexibility into their processing plants. By changing screen sizes and routing coal differently in the processing plant they could produce virtually any size or blend that a customer might request. As a result the screening arrangement in a processing might change daily.[65] Such was the case at Kay Moor, so any description of the flow of coal through the processing plant must be rather general. The following is a description of what appears, from the arrangement of screens in the processing plant when it was shut down for the last time, to have been routine coal flow.

The Main Screening Room:

When coal first entered the processing plant it fed onto a set of flexible support main shaking screens. Shaken in a reciprocating manner by wooden beams mounted to eccentrics, the main shaking screens served as the principal distribution point sorting coal into appropriate sizes to be transported to various areas of the processing plant for storage, washing or loading.

The first of these areas was the slack storage tank. As coal traveled down the main shaking screens it passed over a series of 9/16" and 5/8" screens. Any coal that passed through these screens was fed, through a number of chutes onto a double strand flight conveyor that led to the large slack storage tank. From there it could be loaded either into open railroad cars or into box cars via a Manierre Box Car Loader (Link Belt).

Larger sizes of coal were sent along one of two routes. The majority, routinely sizes that would pass through 3 3/4" screens, was sent to the coal washing room via a double strand flight conveyor fed by chutes leading off the main shaking screen. After washing it was sorted into various sizes for shipment. The smaller sizes, those that passed over the washer's dewatering screens, was returned to the main screening room where it passed over the shaking screens and onto the slack conveyor or, via a chute, into a railroad car.

The largest sizes of coal, those that did not fall through the 3 3/4" screen, passed directly off the main shaking screen and onto one of two apron conveyor loading booms. Screens at the bottom end of main shaking screens could be replaced to sort coal into lump and other sizes. An auxiliary chute located under these screens collected any spillage and transported it, via a chain conveyor, to unloading chutes.

The Coal Washing Process:

On a routine day the coal leaving the screens in the main screening room and entering the wash room would range between 5/8" and 3 3/4". This coal would pass from a double strand flight conveyor into the wash box of Kay Moor's Simon-Carves Baum Jig Washer. As it passed horizontally across the wash box, air pulsations, produced in the agitator box by four air piston jigs, kept the coal suspended in water while heavier particles of refuse dropped to the bottom of the washer tank to be removed by two dewatering elevators. When the coal reached the far end of the wash box it passed onto curved sluices that carried it to a series of sizing screens. Enroute to the sizing screens excess water, mixed with fine coal flowed onto a lower sluice that fed onto two dewatering screens. These two screens, driven by wooden connecting rods on an eccentric shaft, conveyed fines and slack coal onto a double strand flight conveyor leading back into the main screening room and into railroad cars or the slack storage tank. The water passed through the screens into a sump and was recycled, along with water from the refuse dewatering elevators into a large conical tank where it flowed, by gravity, back to the wash box.

The sizing screens sorted the washed coal into 1/4" x 5/8" pea, 5/8" x 1 3/4" nut, 1 1/4" x 3" stove and 3" x 3 3/4" egg coal. These various sizes could either be run through a crusher, loaded separately or mixed into a wide variety of combinations, depending upon customer demand. There were a variety of chutes and belts by which the finished product could be sent to storage or loaded into railroad cars. One belt conveyor carried coal back to the main screening room and into the slack storage tank. A second belt conveyor loaded coal into railroad cars on track one while a third loaded railroad cars on track two. Two chutes coming out of the crusher could load onto tracks one and two. A chain conveyor carried coal over to track four where it could be mixed with larger sizes of coal coming, via a loading boom, off the screens in the main screening room.

Other Track Level Facilities:

In addition to the processing plant and power house, several other facilities were located at track level. The largest of these were the bee hive coke ovens located just up river between the processing plant railroad tracks and the C&O tracks. Consisting of over two hundred ovens arranged in two double rowed batteries, they featured Covington coke extractors.

Directly to the northwest of the processing plant a small shed, that served as a sand drying house, is located. The dried sand was used on the tracks inside the mine to provide traction for the locomotives. A specially built container car carried the sand, via the mountain haulage, from the sand house to the mine.

A few hundred yards downriver from the processing plant, two large oil storage tanks are located. Oil from these tanks was sprayed on coal just before it was loaded into rail road cars. The oil was used primarily to hold down dust but also prevented the coal from freezing into an unusable mass in extremely cold weather.

CONCLUSION:

The surviving structures at Kay Moor tell a valuable story of the evolution of American coal mining technology between 1900 and

1962. On the one hand the adaptability of turn of the century mining practice is revealed. To wrest coal from the steep slopes of the New River Gorge as well as other previously inaccessible coal fields inclined planes were installed in unprecedented number and variety. Kay Moor alone relied on three inclines to move men, equipment, coal and shale. Its monitor incline, which employed an innovative rearrangement of the traditional headhouse, to lower rather than raise coal is an excellent example of old ideas applied to new problems. That it continued to handle the full capacity of Kay Moor's increasingly more productive underground workings for 62 years, is fitting tribute to its workability. The lay out of tracks and drift openings that maximized the narrow bench so high above the floor of the gorge is another example of adaptability.

Once the problem of coal movement on New River's steep slope was solved however, Kay Moor settled into a routine typical of all turn of the century drift mines in bituminous coal seams. The power plant with its gradually increasing yet never adequate power supply is a story that was undoubtedly repeated many times throughout the nation's coal fields. The same is true of the gradually evolving ventilation system, underground working techniques and processing plant. The processing plant alone contains many opportunities for micro studies of evolving mining technology such as the techniques for lowering coal into railroad cars. Kay Moor's Simon Carves Baum Jig Washer is a significant example of the type of new coal washing systems that were installed in American mines during the late 1920s and early 1930s when coal operators were increasingly mechanizing the cleaning of coal.

Aside from being a well preserved collection of mining equipment and structures however, Kay Moor could also serve as the basis for several case studies in the role that human attitudes play in technological innovation. Certainly there are many instances where Kay Moor management adopted state of the art technology in an almost mechanical response to changing market demands. But side by side with this evidence of an occasionally smooth operating dialectic between economics and technology there are also examples of the decisive influence that ideals and collective human perception can play. Low Moor's management was never able to break away from their original concept that Kay Moor was a captive mine designed to produce fuel for its pig iron blast furnaces. By naming first their blast furnace, then their mining operation Moors, a term fraught with images of an old, traditional, self contained estate, they hinted of future inflexibility. Every decision regarding plant improvement was colored by this overriding notion. As flexibility became a byword for the industry most coal mining operations began to install new processing plants that could produce a variety of coal sizes and mixes to a rapidly expanding market. Low Moor retained its old plant that was suited primarily to produce coal for use in bee hive coke ovens. Low Moor had always produced some coal for the general market but, trapped by the concept of the captive mine, it waited until it was too late to build a modern processing plant. When Berwind-White took over Kay Moor they built a new plant and, by catering to a diverse market, were able to operate profitably for thirty seven more years. Working strictly from the rational motive of profit maximization, but trapped within the mental framework of a concept whose time had passed, Kay Moor's owners made a fatal choice. Kay Moor did not pass from the hands of its creators because of failure to maintain productivity--in fact there is little evidence that Kay Moor was less productive in 1924 than it was in 1900--it passed from their hands because they had clung too long to an obsolete idea.

Kay Moor is a significant industrial archaeological site not only because it contains the remains of many historically important artifacts of an era of American coal mining. it is also important because of the written documents, that chronicle its early years, and the memories of its still living miners, that chronicle the latter. These three sources, when combined, can provide much information not only about coal mining per se but also about the inseparable bond between human ideas and technological evolution.

SUGGESTIONS FOR FURTHER STUDY:

Oral History:

Kay Moor's history under Low Moor ownership can be fairly well documented by use of Low Moor Iron Company collection at the University of Virginia. It appears, however that no such collection of New River and Pocahontas Consolidated Coal Company papers survived. It seems therefore, particularly important to fully exploit the one remaining major source of documentation of Kay Moor's operation in its later years; the memories of former Kay Moor employees and their families. The Park Service has conducted a substantial number of oral history interviews but they have been directed more toward life and coal mining in New River in general. What is needed is a collection of interviews dealing specifically with Kay Moor.

These interviews should follow a well prepared format designed to supplement the findings of recent research conducted by Lou Athey, Sharon Brown and Jack Bergstresser. They should be based on a questionnaire that is followed as closely as possible so that information might be cross referenced for verification.

Specific questions related to the technological history of Kay Moor should include the following:

Mine Mechanization:

It is a well established historical fact that mine mechanization and the mechanical cleaning of coal progressed hand in hand. While the coal washing plant at Kay Moor suggests that it was on the cutting edge of the transition to mechanical coal cleaning in the late twenties, little is known regarding underground mechanization. This hiatus is compounded by contradictory terminology employed by the West Virginia Dept. of Mines and The U. S. Bureau of Mines.

How rapidly was Kay Moor mechanized? When was pick mining abandoned? When were mechanical loading techniques developed. What effect did these change, when they occurred, have on the organization of work and labor relations at Kay Moor? The answers to these questions could prove valuable to later efforts to develop the interpretive aspects of Kay Moor for they vitally effected the lives of Kay Moor miners.

They are important historical questions as well because they could be posed as a hypothesis designed to test the important thesis developed by Keith Dix in Work Relations in the Coal Industry: The Hand-Loading Era, 1880-1930. Namely, did the adoption of mechanical loading techniques radically alter work relations in the coal industry? If so, was Kay Moor in line with this transformation or did it lag behind? Can the Dix thesis serve as a model for interpreting this important transitional era? Kay Moor's value as an interpretive facility is greatly enhanced by the fact that, if preserved, it can generate numerous case studies designed to explore important historical questions.

Equipment and Structures:

The scope of the current project precluded detailed studies of individual structures and equipment. From this preliminary study it is obvious that, due to its long life span, many of Kay Moor's individual components went through a good bit of technological evolution. The two fan house, for instance, tell a story of gradual improvement in mine ventilation equipment and techniques. The same is true for the old and new processing plants. Even such secondary elements as loading devices, from the straight open chute installed in 1900 to the loading boom conveyors in the existing plant, are valuable mini-studies in the history of coal mining technology. The same is true of equipment used in the mine such as the haulage locomotives and coal cutting machines. An effort should be made to identify as many, as possible, of the components that went through such processes of evolution and study these changes in detail. Again, such studies would have historical as well as interpretive value.

ENDNOTES

[1]The single track incline that hauled men, equipment and supplies up and down the gorge was called the "mountain haulage" by Kay Moor miners. C. C. Cooke, letter to F. U. Humbert, 21 Mar. 1916, Box 156, Low Moor Iron Company Papers, Manuscript Collection, Alderman Library, Univ. of Virginia, Charlottesville, Virginia. (Hereafter referred to as LMIC)

[2]Lou Athey, Kaymoor: A Coal Community (N. p.: Eastern National Park and Monument Association, 1986) 7-8, 17-18.

[3]Clifford "Knott County" Davis, personal interview, 17 June 1986.

[4]Virgil Burgess who served as mining engineer for the New River and Pocahontas Consolidated Coal Company indicates that the company's papers have probably been destroyed. The exact dates that the various components of Kay Moor's processing plant were built will therefore be difficult to establish. The dates cited here in are based on a telephone interview with Burgess on 25 June 1986.

[5]Matthew P. Marowitz et a., The Low-Moor Iron Company Papers (Charlottesville: Univ. of Virginia Library, n.d.) 7-8.

[6]Ron Lane and Ted Schnepf, Sewell, A New River Community (n. p. Eastern Park and Monument Association, 1985) 3 Athey, 9-10, 13-14.

[7]Lane and Schnepf, 5-7.

[8]E. M. Cabell, letter to E. C. Means, 4 July 1903, LMIC, Box 28.

[9]Athey, 8.

[10]West Virginia Department of Mines, Annual Report, 1901 (Charleston: West Virginia Dept. of Mines, 1901) 204.

[11]Dept. of Mines Annual Report, 1910 Sec. I, 20, Annual Report, 1921 87, Shipments-Outgoing, Coal and Coke, Kay Moor, LMIC, Feb-Aug, 1903.

[12]Fayette Journal 27 Feb. 1925, 1, 13 Nov. 1925, 1. F. E. Lucas, "The Manufacture of Coke," Transactions of the American Institute of Mining Engineers 44 (1913): 170-180, Marowitz, 9-11, Guy E. Mitchell, "Waste in Coking," The Colliery Engineer 34 1913:

74-76.

[13]Virgil Burgess, personal interview, 25 June 1986, Virgil Burgess, interview, Paul Nyden, National Park Service, Oak Hill, West Virginia, 29 July 1985, Tappan A. Sargent, "Enduring Coal Enterprise," The Black Diamond 96 (1936): 21-33.

[14]Dept. of Mines, Annual Report, 1902 21-22, 42, H. E. Wheeler, letter to Erie City Iron Works, 6 Dec. 1902, Letter Book 627, LMIC, Ned Wickes, letter to George T. Wickes, 14 Dec. 1905, Box 87, LMIC.

[15]H. E. Wheeler, letter to Link Belt Engineering Company, 11 Dec. 1902, LMIC, Letter Book 627, Hubert Raven, letter to E. D. Wickes, 15 July 1903, LMIC, Box 68 A, Hubert Raven, letter to E. C. Means, 17 Oct. 1903, LMIC, Box 68 A.

[16]The Coal Field Directory and Mining Catalog, 1915 (Pittsburgh: Keystone Consolidated Publishing Company Inc., 1915) 643. C. C. Cooke, letter to F. U. Humbert, 21 Mar. 1916, LMIC, Box 156, E. M. Cabell, letters to J. W. Monteith, 7 April 1919, 7 May 1919, 8 Aug, 1919, LMIC, Box 17.

[17]Ned Wickes, letter to G. T. Wickes, 14 Dec. 1905, LMIC, Box 87, C. C. Cooke, letter to F. U. Humbert, 21 Mar. 1916, LMIC, Box 156, General Manager, letter to C. C. Cooke, 14 Nov. 1917, LMIC, Box 10 A, The Coal Catalog (Pittsburgh: Keystone Consolidated Publishing Co., 1920) 1053.

[18]A Nelson, Dictionary of Mining (New York: Philosophical Library Inc., 1965) 139, 269, Keith Dix, Work Relations in the Coal Industry: The Hand- Loading Era, 1880-1930 (Morgantown: West Virginia Univ. Bulletin Series, 78, No. 7-2, 1978) 2.

[19]W. P. Tams The Smokeless Coal Fields of West Virginia (Morgantown: West Virginia Univ., 1963) 36-40, A Nelson, 269, Dix, 4-8.

[20]Dix, 14-29.

[21]Ned Wickes, letter to G. T. Wickes, 14 Dec. 1905, LMIC, Box 87, Dept. of Mines, Annual Report, 1901 24, 27.

[22]Dept. of Mines, Annual Report, 1906 64, Annual Report, 1911 76, E. M. Cabell, letter to E. C. Means, 8 Nov. 1906, LMIC, Box 243.

[23]C. C. Cooke, Letters to F. U. Humbert, 6 April 1916, 19 July 1916, LMIC, Box 195, Superintendent, letter to F. U. Humbert, 27 April 1916, LMIC, Box 156.

[24]The Jeffrey Mfg. Co., letter to Low Moor Iron Co., 3 Mar. 1903, LMIC, Box 89 A, Dept. of Mines, Annual Report, 1904 86, The Jeffrey Mfg. Co., letter to E. C. Means, 9 July 1904, LMIC, Box 89 A.

[25]Dept. of Mines, Annual Report, 1909 162, Annual Report, 1911 236, E. M. Cabell, letter to F. U. Humbert, 4 Aug. 1917, LMIC, Box 10 A.

[26]E. M. Cabell, letter to J. W. Monteith, 21 Sept. 1919, Dept. of Mines, Annual Report, 1926 153.

[27]Davis, interview, Burgess, interviews.

[28]E. M. Cabell, letter to J. W. Monteith, 12 June 1919, LMIC, Box 17.

[29]Dept. of Mines, Annual Report, 1901 204-205, Annual Report, 1903, E. D. Wickes, letter to E. C. Means, 3 Feb. 1903, LMIC, Box 243, Hubert Raven, letter to E. C. Means, 15 Dec. 1903, LMIC, Box 68 A.

[30]Dept. of Mines, Annual Report, 1906, E. M. Cabell, letters to J. W. Monteith, 16, 23 June 1919, LMIC, Box 17.

[31]E. M. Cabell, letter to J. W. Monteith, 16 June 1903 LMIC, Box 17, J. R. Robinson, "Recent Developments in Mine Fans," Proceedings: West Virginia Coal Mining Institute (Pittsburgh: The Carson Press, 1910) 210.

[32]E. M. Cabell, letter to J. W. Monteith, 30 Aug. 1919, LMIC, Box 17, Dept. of Mines, Annual Report, 1922, Annual Report, 1928.

[33]Davis, interview.

[34]Davis, interview.

[35]Davis, interview.

[36]Davis, interview.

[37]Letters from mine superintendent E. M. Cabell, written in 1919 refer to work being performed on the slate haulage but it is uncertain if this refers to the original construction or later modification. E. M. Cabell, letters to J. W. Monteith, 17 July 1919, 18 April 1919, LMIC, Box 17, Davis, interview.

[38]The preceding two pages describing the movement of mine cars and locomotives at the bench is based primarily upon the memory of

Clifford Davis but has largely been verified by field inspection. Certain elements, such as the "scotch", which have been entirely removed can not be verified, however.

[39]H. L. Auchmuty, "Hoisting Drums," Mines and Minerals (1904) 37-38.

[40]"Evolution of Mine Haulage," Mines and Minerals (1910) 715-717.

[41]Davis, interview.

[42]The Standard Scale and Supply Company, letter to S. G. Cargill, 3 Aug. 1904, LMIC, Box 126.

[43]Davis, interview.

[44]Description verified by on site inspection of headhouse. All statements regarding headhouse equipment not covered by endnotes have been established by on site inspection.

[45]E. D. Wickes, letter to E. C. Means, 1 Mar. 1903, LMIC, Box 28, Insurance Schedule, Kay Moor Coal Mine by Glen Jean Insurance Agency, Sept. 1908, LMIC, Box 104, Phillips Mine and Mill Supply Co., letter to E. Hibber, 16 May 1917.

[46]Davis, interview.

[47]H. L. Tansill, letter to E. C. Means, 22 Jan. 1903, LMIC, Box 28.

[48]E. M. Cabell, letter to E. C. Means, 27 Oct. 1906, LMIC, Box 243, C. C. Cooke, letter to J. W. Monteith, 11 Oct. 1916, LMIC, Box 105.

[49]Report on Kay Moor mine by R. A. Lipscomb, ca. 1911, LMIC, Box 147.

[50]Edward H. Coxe, "Transportation on Inclines," Mines and Minerals (1900) 10-11, Walter H. Finley, "The Incline," Mines and Minerals (1904) 40-41, William Brasack, "Retarding Conveyor at a West Virginia Mine," Coal Age (1915) 965-966, M. L. O'Neal, "Lowering Coal Down Hillsides with Minimum Breakage," Coal Age (1924) 715-718.

[51]E. D. Wickes, letter to E. C. Means, 17 Mar. 1903, LMIC, Box 28, G. T. Wickes, letter to E. C. Means, 31 Mar. 1906, E. C. Means, letter to Frank Lyman, 13 Mar. 1906, LMIC, Box 87.

[52]Davis, interview.

[53]E. C. Means, letter to E. D. Wickes, 24 Feb. 1903, LMIC, Letter Book 594, H. Reisser, "Evolution of Coal Preparation in West Virginia," Coal Age (1915) 960-963, P. C. Thomas, "Progress and Trends in Low Volatile Production, Proceedings of the Coal Conference on Combustion (Morgantown: West Virginia Univ. Bulletin, Series 38 No. 10-11, 1938) 53-55.

[54]Hubert Raven, letter to E. C. Means, 7 Aug. 1903, E. M. Cabell, letter to E. C. Means, 20 July 1903, LMIC, Box 28.

[55]Hubert Raven, letter to E. C. Means, 31 Oct. 1903, LMIC, Box 68 A, Proposal from The Jeffrey Mfg. Co. to Low Moor, 21 Oct. 1911, LMIC, Box 156, C. C. Cooke, letter to E. Hibbert, 4 Dec. 1915, LMIC, Box 203. E. M. Cabell, letters to J. W. Monteith, 6 Feb. 7 May 1919, LMIC, Box 17.

[56]General Manager, letter to The Webster Mfg. Co., 25 Mar. 1916, LMIC, Box 184. E. M. Cabell, letter to J. W. Monteith, 14 Feb. 1919, LMIC, Box 17.

[57]Proposal from The Jeffrey Mfg. Co., to Low Moor, 16 Sept. 1911, LMIC, Box 156, Miner Raymond, "Loading Bituminous Coal," Coal Age (1915) 967-969.

[58]General Manager, letter to The Webster Mfg. Co., 25 Mar. 1916, LMIC, Box 184.

[59]Other improvements that were carried out at the time included repair, or possibly installation for the first time, of the slate haulage incline, repairs to the monitor incline and new monitor cars. Manager of Mines, letter to E. M. Cabell, 7 Dec. 1918, LMIC, Box 106, Jeffrey Mfg. Co., letter to G. W. Lipscomb, 20 Feb. 1918, Purchasing Agent, letter to Jeffrey Mfg. Co., 28 Feb. 1918, LMIC, Box 111.

[60]Virgil Burgess, interviews. "Trends in Coal Preparation," Mechanization 5 No. 4 (1941) 68.

[61]Joseph Purseglove, Jr., "Coal Cleaning in the Appalachian Fields," Coal Mine Modernization, 1940 Yearbook (Washington, D. C.: The American Mining Congress, 1940) 83-89, "Trends in Coal Preparation," 70.

[62]W. R. Chapman, The Cleaning of Coal (London: Chapman & Hall Ltd., 1928) 99.

[63]Chapman, 119-153, George P. Scholl, "Digest of Current Mining

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[64]Chapman, 157-158, "Trends in Coal Preparation," 68.

[65]G. R. Dalamater, "The Screening of Coal," Proceedings of the Fourth Annual Conference on Coal (Morgantown: West Virginia Univ. Bulletin, Series 41, 8-11, 1941) 44-55.

[66]No exact documentation of the sizes produced in Kay Moor's has been located as yet but an article describing a similar operation lists the sizes cited. It seems reasonable that Kay Moor produced approximately the same basic sizes. F. C. Carothers, "Preparing Coal at Pond Creek Pocahontas Company," Coal Mine Modernization, 1934 Yearbook (Washington, D. C.: The American Mining Congress, 1934) 172.

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ADDENDUM TO:
KAYMOOR COAL MINE
New River National River
southside of New River, upstream of New River Gorge Bridge
~~Oakhill Vicinty~~ Fayetteville Vic.
Fayette County
West Virginia

HAER No. WV-38

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ADDENDUM TO:
KAYMOOR COAL MINE
New River Gorge National River
New River Gorge National River
S. side of New River,upstream of N.R.G. Bridge
Fayetteville vicinity
Fayette County
West Virginia

HAER No. WV-38

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